

ABSTRACT OF THE DISCLOSURE

Metallic films are grown with a "spongelike" morphology in the as-deposited condition using planar magnetron sputtering. The morphology of the deposit is characterized by metallic continuity in three dimensions with continuous and open porosity on the submicron scale. The stabilization of the spongelike morphology is found over a limited range of the sputter deposition parameters, that is, of working gas pressure and substrate temperature. This spongelike morphology is an extension of the features as generally represented in the classic zone models of growth for physical vapor deposits. Nickel coatings were deposited with working gas pressures up 4 Pa and for substrate temperatures up to 1000 K. The morphology of the deposits is examined in plan and in cross section views with scanning electron microscopy (SEM). The parametric range of gas pressure and substrate temperature (relative to absolute melt point) under which the spongelike metal deposits are produced appear universal for other metals including gold, silver, and aluminum.